What is claimed is:

1. A method of operating a low-dropout voltage (LDO) voltage regulator, the method comprising:

determining a leakage current demand of a load of the LDO voltage regulator; and

supplying leakage current from a leakage current supply source to meet the leakage current demand of the load of the LDO voltage regulator.

2. The method of claim **1**, comprising receiving a maximum supply voltage as an input of the LDO voltage regulator and providing an output voltage to the load of the LDO voltage regulator, wherein supplying the leakage current from a leakage current supply source comprises reducing a headroom voltage of the LDO voltage regulator, wherein the headroom voltage of the LDO voltage regulator is a difference between the maximum supply voltage and the output voltage provided to the load of the LDO voltage regulator.

3. The method of claim **1**, wherein determining the leakage current demand of the load of the LDO voltage regulator comprises sensing leakage current of the load based on temperature, voltage, and process corners related to the load.

4. The method of claim **3**, further comprising determining a frequency of a ring oscillator based on the sensed leakage current of the load.

5. The method of claim **1**, further comprising converting the sensed leakage current to a digital code.

6. The method of claim **5**, further comprising determining, from the digital code, a number of p-channel metal oxide semiconductor (PMOS) transistors to be switched on to supply the leakage current from the leakage current supply source.

7. The method of claim **6** comprising increasing the number of PMOS transistors to be switched on for higher values of the digital code and decreasing the number of PMOS transistors to be switched on for lower values of the digital code.

8. The method of claim **1**, wherein the load of the LDO voltage regulator is a processing core of a multi-core processing system.

9. An apparatus comprising:

a leakage current supply source comprising:

a leakage current sensor configured to determine a leakage current demand of a load of a low-dropout voltage (LDO) voltage regulator; and

a leakage current supply circuit configured to supply leakage current to meet the leakage current demand of the load of the LDO voltage regulator.

10. The apparatus of claim **9**, wherein the low-dropout voltage (LDO) voltage regulator is configured to receive a maximum supply voltage and provide an output voltage to the load of the LDO voltage regulator.

11. The apparatus of claim **10**, wherein the leakage current supply source is configured to reduce a headroom voltage of the LDO voltage regulator, wherein the headroom voltage of the LDO voltage regulator is a difference between the maximum supply voltage and the output voltage provided to the load of the LDO voltage regulator.

12. The apparatus of claim **9**, wherein the leakage current sensor is configured to sense the leakage current demand of the load of the LDO voltage regulator based on temperature, voltage, and process corners related to the load.

13. The apparatus of claim **12**, wherein the leakage current sensor comprises a ring oscillator, wherein a frequency of the ring oscillator is based on the sensed leakage current demand of the load.

14. The apparatus of claim **13**, wherein the ring oscillator comprises an odd number of inverters connected in a ring.

15. The apparatus of claim **14**, wherein the inverters are current-starved based on head switches, foot switches, or a combination thereof, configured to allow only leakage current to pass through.

16. The apparatus of claim **14**, wherein the inverters are differential inverters.

17. The apparatus of claim **12**, wherein the leakage current sensor comprises an analog to digital converter (ADC) configured to convert the sensed leakage current demand to a digital code.

18. The apparatus of claim **12**, further comprising a finite state machine (FSM) configured to determine, from the digital code, a number of p-channel metal oxide semiconductor (PMOS) transistors to be switched on in order to supply the leakage current from the leakage current supply circuit.

19. The apparatus of claim **18** wherein the number of PMOS transistors to be switched on is higher for higher values of the digital code and the number of PMOS transistors to be switched on is lower for lower values of the digital code.

20. The apparatus of claim **9**, wherein the load of the LDO voltage regulator is a processing core of a multi-core processing system.

21. The apparatus of claim **9**, integrated in integrated into a device selected from the group consisting of a set top box, music player, video player, entertainment unit, navigation device, communications device, personal digital assistant (PDA), fixed location data unit, mobile phone, and a computer.

22. A system comprising:

means for determining a leakage current demand of a load of a means for regulating voltage; and

means for supplying leakage current to meet the leakage current demand of the load.

23. The system of claim **22**, wherein the means for determining the leakage current demand of the load comprises means for sensing the leakage current demand of the load based on temperature, voltage, and process corners related to the load.

24. The system of claim **23**, further comprising means for converting the sensed leakage current demand to a digital code.

25. The system of claim **24**, further comprising means for determining, from the digital code, a number of p-channel metal oxide semiconductor (PMOS) transistors to be switched on in order to supply the leakage current demand of the load.

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